VS 1101: Geometry and Its Discontents

SCI-Arc Fall 2024

Course Abstract:

The first semester Bachelor of Science in Design course in Visual Practices introduces students to fundamental principles of geometry and conceptual problems of abstraction through partially self-guided exercises in 3D modeling and two-dimensional projection. The course will also investigate the complex conceptual relationship between visual media and their objects of representation, and prompts students to forge connections between aesthetics and theory. Exercises and course materials emphasize a playfully critical self-reflexivity over the various factors influencing observation, with the aims of developing original ideas that lead to a series of self-realized design projects.

Course Description:

This course is the first iteration of the Visual Studies track within the two-year foundational sequence of the Bachelor of Science in Design. This course aims to equip students with technical and conceptual tools for understanding the basic elements of geometry - point, line, plane, and volume - and oscillate across these dimensions by bringing designed drawings and models into and out of the software environment. The course's historical and conceptual content builds upon the subject matter of the first-semester Cultural History course, and as such investigates the technical apparati being utilized with the same level of attention as the cultural contexts in which those apparati were and continue to be developed, guiding students along a brief historical analysis of fundamental concepts such as systems of geometry, perspective drawing, photography and computer graphics. Furthermore, we will investigate the philosophical connection of language to form, and play with the idea of semantic ambiguity as a tool for the making of form and images. Throughout the course of this class, students will be given techniques for the development of a conceptual understanding of the capacities and constraints of the tools they have at hand, at once equipping them with basic tools of design and provoking them to begin an unfolding process of ontological inquiry that will carry them through the remainder of their academic career.

Course Organization:

The course is divided into four sections with each one culminating in a self-realized design project pertaining to the tools and topic covered in each section. The first week of each section will begin with a tutorial introducing students to the basics of software and tools for design and representation. Attendance to these tutorials is optional, as they will be recorded and sent to students who prefer to utilize them at their own pace.The second week will consist of a short lecture serving as a platform for discussion on conceptual and historical concepts pertinent to the development of technologies being utilized in the class. The third week of each section is a working session for additional technical aid and longer desk crits, and the final week of each 4-week section will culminate in a pinup and group discussion of student work.

Learning Objectives:

- Ability to accurately and compellingly describe three-dimensional form through two-dimensional forms of representation

- Ability to precisely 3D model geometries and bring those geometries in and out of the software environment in the form of drawings, photographs, paper models and 3D prints

- Ability to think critically about each phase of the design process and realize projects through a playful mode of self-driven inquiry rather than an iterative and prescribed process of sequential instruction

- Ability to work independently and make deliberate choices about which tools to utilize for their specific desired ends

- Ability to understand and articulate design problems in natural language through participation in group discussions at lectures and pinups

Project Overview:

1st Dimension: The Sound of One Hand Clapping

Wk. 01 - Syllabus, Assignment 1: *Tumbling Things Around Aimlessly*
Wk. 02 - Discussion: *Thing Theory and a Brief History of Space*
Wk. 03 - Desk Crit
Wk. 04 - Group Pinup

2nd Dimension: Flatland, the Romance of Two and a Half Dimensions

Wk. 05 - Assignment 2: *Beauty and the Boolean*
Wk. 06 - Discussion: *Stereotomy, Splines, and the Knife of Reason*
Wk. 07 - Desk Crit
Wk. 08 - Midterm Pinup

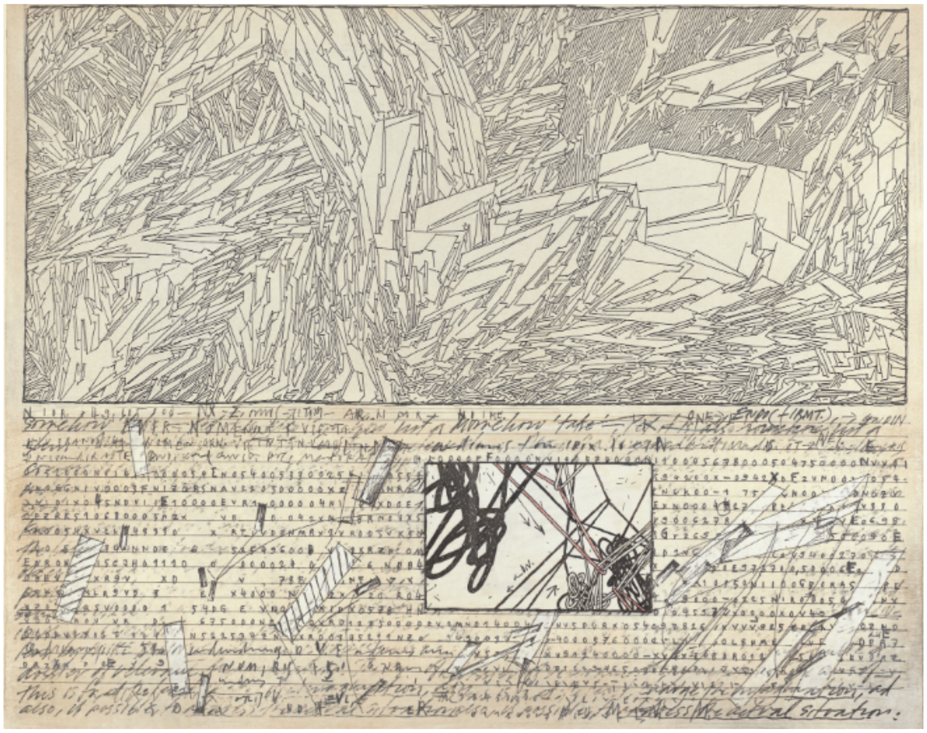
3rd Dimension: Co-opting the Cartesian Grid

Wk. 09 - Assignment 3: *Incandescent Objects*
Wk. 10 - Discussion: *Secret Knowledge and the Photosynthetic Grid*
Wk. 11 - Desk Crit
Wk. 12 - Group Pinup

4th Dimension: The Tyranny of the Tesseract

Wk. 13 - Assignment 4: *Casting the Luminiferous Aether*
Wk. 14 - Discussion: *Coffee and Donuts, Topology and the Myth of Meaning*
Wk. 15 - Desk Crit
Wk. 16 - Final Pinup

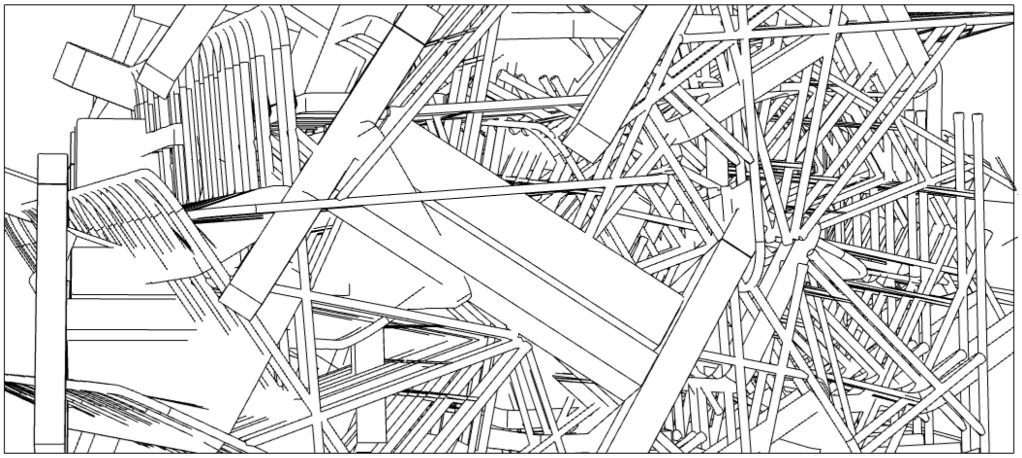
1st Dimension: The Sound of One Hand Clapping



Lebbeus Woods, *Terrain, project.* 1999

The 1st Dimension of the course introduces students to the 3D modeling software environment through an exercise in three-dimensional sampling and composition and two dimensional representation. It explores the inherent conceptual contradiction of 3D modeling software; a virtual three-dimensional environment being represented solely through the two-dimensional media of the screen, the drawing, or the rendering. This portion of the course will also investigate the contextual ambiguity of meaning in language itself as a system of signifiers for the description of form, and through this, developing a loose method for producing formal abstraction. By deploying a basic set of technical tools and then calling the mechanisms of those tools into question through historical and theoretical analysis, students are invited to begin to nurture a sensibility to both the potential as well as the conceptual limitations of the tools they are using as they are learning them. The lecture and discussion portion of this section will delve into a brief history of Euclidean geometry, the development of non-Euclidean geometry at the end of the 19th century, and the sociocultural contexts and ramifications of that development as well as its adaptations in the realm of the arts and humanities.

Assignment 1: *Tumbling Things Around Aimlessly*



Come up with a set of 4 single consonant nouns (tree, cat, mouse, plug, etc) Using each noun as a search term within any free 3D model database (cgtrader, turbosquid, etc.), find three distinct forms that fit within the same category of object (for example: the word *Chair* yields results for a folding chair, a cushioned arm chair, and a barstool). Import each of these objects into one Rhino File, and using only the gumball tool and the provided list of commands, find ways to copy, scale, mirror, arrange and intersect the objects and obscure their original form into several iterations of dynamic compositions. From a single carefully organized Rhino file, create a set of 4 developed drawings; one for each noun.

Composition Commands:

GumballAlignment, ArrayLinear, ArrayPolar, BoundingBox, Copy, Import, Mirror, Move, Make2D, NamedView, Orient, Orient3pt, ReduceMesh, Rotate, Rotate3D, Scale, Group, Ungroup, ViewCaptureToFile, ZoomSelect, ZoomExtents

Drawing Commands:

Arc, Curve, Circle, Line, Polyline, Rectangle, Bounding Box, Connect, CurveBoolean, Chamfer, CloseCrv, Copy, Divide, Explode, Fillet, InterpCrv, Join, Mirror, Move, Offset, Orient, Rotate, Scale, Scale1D, Split, Trim, Group, Ungroup, SelOpenCrv, SelClosedCrv

1st Dimension: The Sound of One Hand Clapping

Assignment 1: *Tumbling Things Around Aimlessly*

- Introduction to Rhino 3D interface
- Import + Export of OBJs
- Gumball and commands for arranging objects in 3D space
- Composition and basic CAD drawing tools

Lecture: *Thing Theory and a Brief History of Space*

- Euclidean space and the Cartesian Coordinate System
- Synopsis of Euclid's Elements and its historical significance
- Overview of difference between parallel and perspective projection and a brief history of each system (Brunelleschi and Duhrer)
- Descartes and the dualism inherent to the cartesian system
- Non-Euclidean Geometry and the problem of scale
- Heisenberg's Uncertainty Principle and general principles of quantum mechanics
- Summary of Bill Brown's 2001 essay with a focus on his analysis of Claes Oldenburg's Typewriter Eraser

2nd Dimension: Flatland, the Romance of Two and a Half Dimensions

Assignment 2: *Beauty and the Boolean*

- Introduction to NURBs and solid modeling tools
- Rebuild simplified versions of imported OBJs from line drawings
- Boolean operations and other tools for clean 3D manipulation
- Unfolding polysurfaces to build laser cut matte board models

Lecture: *Stereotomy, Splines, and the Knife of Reason*

- Brief overview of stereotomy and descriptive geometry via Dürer and Guarini
- History of Splines/NURBs and historical connection to shipbuilding
- Overview of Pirsig via *The Knife and the One*
- Overview of Deleuze and Guattari *The Smooth and the Striated*
- Edwin Abbot's *Flatland* as an analogy for surgical striation of smooth space

3rd Dimension: Co-opting the Cartesian Grid

Assignment 3: *Incandescent Objects*

- Manual application of painted texture to objects from assignment 2
- Overview of techniques for model photography and Adobe Photoshop basics
- Extracting texture maps from photographs and applying to Rhino model
- Intro to basic rendering techniques using V-Ray for Rhino

Lecture: *Secret Knowledge and the Photosynthetic Grid*

- Brief history of photographic technology from Niepce to Nikon
- Overview of David Hockney's *Secret Knowledge* and Barthes' *Camera Lucida* (studium/punctum)
- Overview of John Berger's *Ways of Seeing*
- The turn from analog to digital - film to sensor, megapixels = grid
- Touch on AI Image Generation = pixel pattern recognition algorithm + massive datasets
- Brief history of rendering and computer graphics, XYZ + UV

4th Dimension: The Tyranny of the Tesseract

Assignment 4: *Harvesting the Luminiferous Aether*

- Intro to mesh modeling in Blender, import + export to Rhino
- Overview of 3D printing, cleaning up models and prepping STLs
- Intro to mold-making and hydrocal plaster casting

Lecture: *Coffee and Donuts, Topology and the Myth of Meaning*

- Coffee to Donut transformation, introduction to topology
- Euclidean space and Spacetime as distinct forms of topological space
- John Szarkowski's concept of Coffee and Donuts in the description of photographs
- Empiricism and OOO as metaphysical models for topological space

Concept Tools:

1. **Thingness**

One of the most fundamental concepts of quantum mechanics is Heiseinberg's indeterminacy principle, which states that the more accurately one attempts to measure an object's position in space, the less accurately one can know its momentum, and vice versa. What this meant at the time of its discovery was that our systems of measurement for understanding the world were insufficient in their ability to describe space as modern science now understood it. A parallel can be drawn between Heisenberg's Uncertainty principle as a scientific concept, and theories in the realm of philosophy concerning "knowability" of objects. In Thing Theory, an essay by Bill Brown, he describes "objects" as items for which subjects have a clear sense of place, use and role. Whereas "things" manifest themselves once they interact with our bodies, break down, malfunction, shed their encoded social values, or elude our understanding… which in turn causes a reconfiguration between the "subject" and the "object", in contrast to the Dualist view that holds subjects and objects, and therefore mind and body, as distinct and knowable entities along a hypothetical number line like in Rene Descartes theory of mathematics. In quantum theory space is a nonlinear entangled fabric, and the concept of superposition is the notion that subatomic particles exist in a simultaneous state of both positive and negative charge and only come out of that state once they are being measured and observed. In thing theory, one could say that Thingness is a conceptual state of entangled superposition where things are in a simultaneous state of subjecthood and objecthood. Brown dedicates a considerable amount of his essay to an artwork by Claes Oldenburg entitled, *Typewriter Eraser, Scale X*. In the act of scaling up an object and removing it from its original context, both in physical space and in historical time as an object that is familiar to a certain generation (consider the floppy disk), Brown argues that Oldenburg is stripping the typewriter eraser of its objecthood and bringing it into an ambiguous state of Thingness. Consider the Zen Koan: “What is the Sound of One Hand Clapping?” This Koan takes the form of a question, which is used by students of Zen Buddhism as a kind of meta-thought experiment to instill an understanding of the limits of thought itself and provoke what they call the “great doubt”. It acts as a sort of intellectual implementation of the Uncertainty Principle, forcing students of zen to embrace a mind state of uncertainty and unknowability. This state might then give way to what Jacques Derrida refers to as *différance*, a difference and an intentional deferral of assigned meaning that gives affordance to Thingness as a state of *incertidumbre.*

2. The Satchel and the Scalpel

In Ursula Le Guin’s *Carrier Bag Theory of Fiction*, an argument for the human origins of prose is made by building off of Elizabeth Fisher’s Carrier Bag Theory of human evolution that considers the container, the bag, the sling or the satchel as the first cultural device, before the prominent theories of evolution that considered the ax, the knife or other weapons as the first forms of technology. Le Guin goes on to say that books act like carriers for worlds, words and ideas, much like the carriers of early humans held food picked from the wild. However, our participation in the picking of food and the seemingly incessant human need to gather things is perhaps what precedes the creation of the container. Metaphorically speaking, the picking of food is itself like what Rasmus Grønfeldt Winther in *The Knife and the One* describes as a cut, the act of categorizing and separating things from their untamed state in nature. Winther goes on to quote Robert Pirsig on analytical reasoning itself being a type of metaphysical scalpel that cuts the world into pieces in order to understand it, and categorize the complexity of a world which cannot possibly be comprehended in its synthesized state of wholeness. Winther doesn’t, however, deem the cut as an inherent act of violence or that it is somehow harmful, though he acknowledges that it can be and gives mention to how Pirsig was driven to madness searching for what he called “the ghost of reason”; in effect, his intellectual scalpel’s designer. Winther concludes with making a distinction between mind and heart, and that analytical reasoning is a function of the cerebral cortex; by reconnecting to the heart we are reminded that we are connected to a synthesized whole, and that the knife becomes a tool for violence once the needs of the heart are ignored or repressed. The heart is a vessel, it is a Carrier Bag. In order to maintain balance between the heart and mind, it is imperative to think critically about the knife by asking questions like (1) How clean is each cut? (2) Do the knife's cuts follow pre-existing fault lines in reality? Or, as is more commonly asked: "do we carve nature at its joints?" (3) Who owns the knife, and how did they build it?

Building off of Winther’s corporeal analogies, perhaps we might reconsider that first piece of technology of the ax used to split the skull of an enemy neanderthal as an interpretation of the violent use of an analytical knife. An ax could be used to fell a tree and provide shelter or warmth, just as a carrier bag could be used for asphyxiation. The scalpel, a tool used in the work of healing people, serves as a model for analytical reasoning, the work of the mind, existing in a state of balance with the mind's vessel: the body. Once we have learned to hold space for other bodies, we pick fruits from them to put into our satchels and create surplus. And with our scalpels, divide that surplus. And then trade fruits for seeds. And then…

Research Scope:

Can students acquire the technical skills and aesthetic sensibility of an architectural designer in approximately one-third of the time allotted to the traditional architectural design studio? Will less class time necessarily promote students' mental health and overall well-being?

Sources:

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John May - Everything is Already an Image

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Lila by Robert M. Pirsigr

The Doors of Perception by Aldous Huxley

The Age of Earthquakes by Shumon Bassar and Hans-Ulrich Obrist

Patricia Reed - The End of a World and its Pedagogies

John Cage - Other People Think

Moten & Harey - The Undercommons

la paperson - A Third University is Possible

bell hooks - All About Love

Renaissance Self-Fashioning - Steven Greenblatt

Rosalind Krauss - The Grid

The Century of the Self

Donna Haraway - A Cyborg Manifesto

Kathryn Yussof - A Billion Black Anthropocenes or None

W.E.B. Dubois on Double Consciousness